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THE RIBES OF WASHINGTON.
By Stephen N. Wyckoff, Assistant Pathologist,
Office - Blister Rust Control,
Bureau of Plant Industry.

The keys and descriptions of the Ribes and the rusts on Ribes which are given here are intended for the use of blister rust men working in the State of Washington. As most of the blister rust field work is done during the summer months, the first Ribes key is based entirely on vegetative and fruit characters. A second key is also included, which is based on vegetative and flower characters. The descriptions are to be used in conjunction with either key.

Until a few years ago currants and gooseberries were both included in the genus Ribes under the family Saxifragaceae. But according to our present knowledge of botanical relationships the old genus Ribes is considered as the family Grossulariaceae, and is divided into the two genera; Ribes, or currants, and Grossularia, or gooseberries. For the sake of convenience and brevity, the term Ribes is still used in blister rust work to designate both currants and gooseberries collectively. Used in this looser sense the term Ribes is synonymous with the family name of Grossulariaceae.

The Grossulariaceae, or currants and gooseberries, are shrubs varying in height from $\frac{1}{2}$ to $3\frac{1}{2}$ meters. A majority of the species have nearly erect stems, while a few grow prostrate on the ground or have their stems rising obliquely. All of the gooseberries and a few of the currants have strong, sharp spines at the nodes, or joints of the stems and

branches, and often have more numerous but weaker spines between the nodes. The leaves are always alternate, that is, there is never more than one leaf twig or cluster starting from one place on a stem. The leaves are palmately veined, that is, with several large veins starting from the base of the leaf, and are more or less palmately lobed, or divided. In addition to the lobes, or larger divisions, the margins are more or less finely cut into teeth.

Either or both of the leaf surfaces and also the fruit may bear certain appendages which are of importance in this key in distinguishing between the various species.

These appendages are:

1. **HAIRS** (pubescence). These are practically always whitish in color, and may be sparse or dense, coarse or fine, and straight or curled. Only the presence or absence of hairs is considered in this key, no differentiation being made as to their form.

2. **RESIN-DOTS**. (These are glands without stalks, or sessile glands.) They appear as small, round, flat dots, yellowish or reddish brown in color, very slightly if at all raised above the surface of the leaf, and with a small depression in the center. They are composed of a semi-transparent shining secretion, somewhat resembling amber.

3. **STALKED GLANDS**. These are rather like very stout hairs except that they bear a small round knob at the tip. They vary greatly in size, in the length of the stalk, and in color. The stalked glands on the

leaves of *Grossularia cognata* and *G. irrigua* are so small that they can often be seen only with a hand-lens. Those occurring on the fruit of *Ribes lacustre* and *R. montigenum* are very long-stalked, with the weak stalks often curved. The color of the stalked glands often varies with the age of the leaf or fruit on which they are borne.

The fruits are borne several to many in a slender cluster which may stand erect or droop. This form of cluster (raceme) consists of a central stalk (peduncle or rachis) from which small stalks (pedicels) arise, each of which bears a single fruit. At the base of each of these individual fruit-stalks there is a small leaf structure known as a bract. The form of the bracts is sometimes of considerable importance in recognizing certain species. This is particularly true in the case of *R. bracteosum*, where the lower bracts of the fruit-cluster are quite large, and with a leaf-stalk, like the leaves.

Ribes fruits are round or sometimes oval, and vary considerably in size and color. They may bear hairs, resin-dots, or stalked glands similar in form to those found on the leaves. The *Ribes* flowers are persistent, that is, they remain in a withered condition at the tip of the fruit. These persistent flowers may be small, open, and spreading directly from the fruit, or they may be tubular, with the lobes spreading above the tube.

It is customary to think of gooseberry plants as being spiny, and currant plants as being spineless. This distinction, however,

will not always hold. *R. lacustre* and *R. montigenum*, the former a very common species in Washington, are currants that are very spiny, while *G. inermiss*, a typical gooseberry, has only a few very inconspicuous spines. In such cases as these, it is only by an examination of the flowers or fruit that the true relationship of the plant can be determined.

The presence of a joint between the individual fruit-stalk and the fruit in the case of currants, and the absence of this joint in the gooseberries is a sure and obvious differentiating character between currants and gooseberries. If ripe gooseberry fruits are picked, or if the old fruits are found on the ground beneath the bush, they almost invariably have the individual fruit-stalk attached to the fruit. That is, the joint, or break, naturally occurs between the individual fruit-stalk and the common fruit-stalk, and not between the individual fruit-stalk and the fruit. On the other hand, if currant fruits are picked, or found on the ground, they very rarely have the individual fruit-stalks still attached. In this case the break naturally occurs between the individual fruit-stalk and the fruit.

KEY TO THE RIBES OF WASHINGTON.

1. Plants without spines on the stems and branches.
 - A. Leaves with numerous yellow or reddish-brown resin-dots on the lower surface.
 1. Resin-dots on the lower leaf surface

yellow when the fruit is ripe. Fruit black, with or without bloom, with yellow resin-dots, similar to those on the leaves. Fruit clusters standing erect. Plants with a characteristic disagreeable odor.

a. Leaves deeply 5-7-lobed, the lobes narrow and sharply pointed. Fruit black with a white bloom, loosely borne in a very long cluster. Lower bracts leaf-like. Shade and moisture loving plants of western Washington.....*1.R.bracteosum.*

b. Leaves 3-5-lobed, the lobes broad. Fruit black without bloom, compactly borne in a shorter cluster. Bracts very small, all of an equal size. Plants occurring east of the Cascades.....*2.R.petiolare.*

2. Resin-dots on the lower leaf surface reddish-brown when the fruit is ripe. Fruit black with a white bloom, bearing stalked glands but no resin-dots. Fruit-clusters drooping. Plants without disagreeable odor. Found only at high altitudes in the Olympics and Cascades.....

.....*3.R.acerifolium.*

B. Leaves without resin-dots on the lower surface, with or without stalked glands.

1. Leaves without stalked glands, with or without hairs.

a. Fruit bearing stalked glands, black, with or without bloom.

(1) Shrubs erect. Lower leaf surface densely covered with white, woolly, matted hairs. Plants of western Washington, occurring along the coast, and at middle altitudes in the Olympics and Cascades.....

.....*4. R. sanguineum.*

(2) Shrubs with branches reclining on the ground, their ends tending to rise. Leaves only slightly if at all hairy beneath. Plants occurring at low altitudes along the Pacific Ocean, and at middle altitudes in the Olympics and Cascades.....

.....*5. R. laxiflorum.*

b. Fruit, without stalked glands, black, red, or yellow. Leaves without hairs or only slightly hairy.

(1) Erect shrubs with leaves wedge-shaped to straight across at the base, without hairs. Plants of the lower, drier regions east of the Cascades.....

.....*6. R. aureum.*

(2) Shrubs prostrate or with stems rising obliquely upward. Leaves heart-shaped at the base, sometimes hairy. Plants occurring only at high altitudes in the southern part of the Cascades.....

.....*7. R. triste.*

2. Leaves with stalked glands on both surfaces, with or without hairs.

a. Fruit, bright red, round, smooth or with stalked glands. Foliage grayish-green.

Dryland plants occurring only east of the Cascades.....
.....*8. R. cereum.*

b. Fruit, black, oval, with stalked glands. Foliage deep green. Plants occurring east of the summit of the Cascades at middle and higher altitudes.....
.....*9. R. viscosissimum.*

II. Plants bearing spines on the stems and branches.

A. Fruit black, red, or brown, and bearing stalked glands or sharp prickles.

1. Fruit bearing stalked glands but not sharp prickles.

a. Fruit red or black, round, bearing a few long-stalked glands.

(1) Leaves without hairs or stalked glands. Fruit black without bloom. Plants widely distributed over Washington, growing in moist soils.....
.....*10. R. lacustre.*

(2) Leaves hairy and with stalked glands on both surfaces. Fruit red. Found only in dry places at high altitudes in the Cascades.....
.....*11. R. montigenum.*

b. Fruit brown to purplish-brown, oval, densely covered with short-

stalked glands. Plants occurring in western Washington, in the coast and Puget Sound region and on the lower slopes of the Cascades.....*12. G. lobbii.*

2. Fruit densely covered with long, sharp, yellowish-brown prickles. Found only in the Cascades above 5000 feet.....

.....*13. G. watsoniana.*

B. Fruit without glands, hairs, or prickles, black or dark purple.

1. Leaves bearing very fine stalked glands at least on the lower surface, and hairy, more so on the lower than upper surface.

a. Young branches bearing rather soft, weak spines between the nodes. Leaves densely hairy below, and at least sparsely hairy above. Plants of extreme eastern Washington....

.....*14. G. cognata.*

b. Young branches without spines between the nodes. Leaves finely hairy below, hairless except along the veins above. Plants of extreme eastern Washington.....

.....*15. G. irrigua.*

2. Leaves sometimes hairy but never bearing stalked glands.

a. Leaves with rounded, few-toothed lobes, wedge-shaped to straight across at the base. Young branches reddish-brown, without





Ribes bracteosum Dougl.

spines between the nodes. Plants occurring only in extreme southeastern Washington.....

.....*16.G.nivea.*

b. Leaves with pointed lobes, finely toothed, heart-shaped to nearly straight across at the base.

Young branches gray to brown, smooth, spiny, or hairy.

(1) Stems and branches bearing strong stout spines at the nodes. Plants occurring only west of the summit of the Cascades.....*17.G.divaricata.*

(2) Stems and branches with only small inconspicuous spines at the nodes, these often wanting on many of the branches. Plants occurring only east of the cascades.....*18.G.inermis.*

1. RIBES BRACTEOSUM DOUGL.

Ribes bracteosum is a tall, erect shrub, often 3 meters high, with thick, blunt pointed stems, and large whitish buds. The leaves are very large, often 20 centimeters and sometimes 30 centimeters wide. The larger ones are generally 7-lobed and the smaller ones 5-lobed, the lobes being narrow and sharp pointed, with deeply and sharply toothed margins. They always bear numerous yellow resin-dots on the lower surface, and occasionally have scattered hairs on either surface. The fruit-

clusters are very long, occasionally 30 centimeters, erect, with the fruit loosely borne along the upper four-fifths of the stalk. The lower bracts of the cluster are leaf-like in form, being definitely lobed and with a leaf-stalk, while the upper ones are much smaller, narrow, and not lobed or stalked. The fruit is black with a white bloom when ripe, round and bearing yellow resin-dots. The withered persistent flowers remaining on the fruit are small and saucer-shaped.

When in blossom the flowers are greenish or greenish-white and saucer-shaped.

Note: compare material carefully with the description of *R. petiolare*, particularly as to the size and shape of the bracts, and the length of the fruit-clusters.

HABITAT AND DISTRIBUTION. *Ribes bracteosum* characteristically grows in the shade, in very moist but well-drained soils. It is often found along small rapid flowing streams. It commonly occurs in the humid region of western Washington and is occasionally found on the upper east slopes of the Cascades.

2. RIBES PETIOLARE DOUGL.

Ribes petiolare is an erect but rather low shrub, seldom exceeding 1.5 meters in height. The leaves are quite large, sometimes 15 centimeters in width, but differ from those of *R. bracteosum* in that the larger ones are not more than 5-lobed and that the lobes are



Ribes petiolare Dougl.

broad, with wide shallow divisions. The sharp saw-teeth of the margins are smaller than in *R. bracteosum*. The leaves are resin-dotted beneath, and are occasionally hairy when young. The erect fruit-clusters are much shorter than in *R. bracteosum*, with the fruit borne close together and compactly on the upper four-fifths of the stalk. The bracts are all equal in size and are very small, often being hardly visible without the aid of a hand-lens. The fruit is black, without bloom, small, round and resin-dotted. The persistent flower remains are similar to those of *R. bracteosum*.

When in blossom the flowers are white and saucer-shaped.

Note: compare material closely with the description of *R. bracteosum*, as to the size of the bracts and the length of the fruit-clusters, and with the description of *R. acerifolium*, as to the presence or absence of stalked glands on the fruit, and the erect or drooping fruit-clusters.

HABITAT AND DISTRIBUTION. *Ribes petiolare* is a shade loving plant, growing along streams and on wooded mountain slopes. It occurs in the yellow pine forests of the semi-arid region, on the east slopes of the Cascades and in the Blue Mountains.

SYNONYM: *Ribes hudsonianum petiolare* Jancz.

3. RIBES ACERIFOLIUM HOWELL

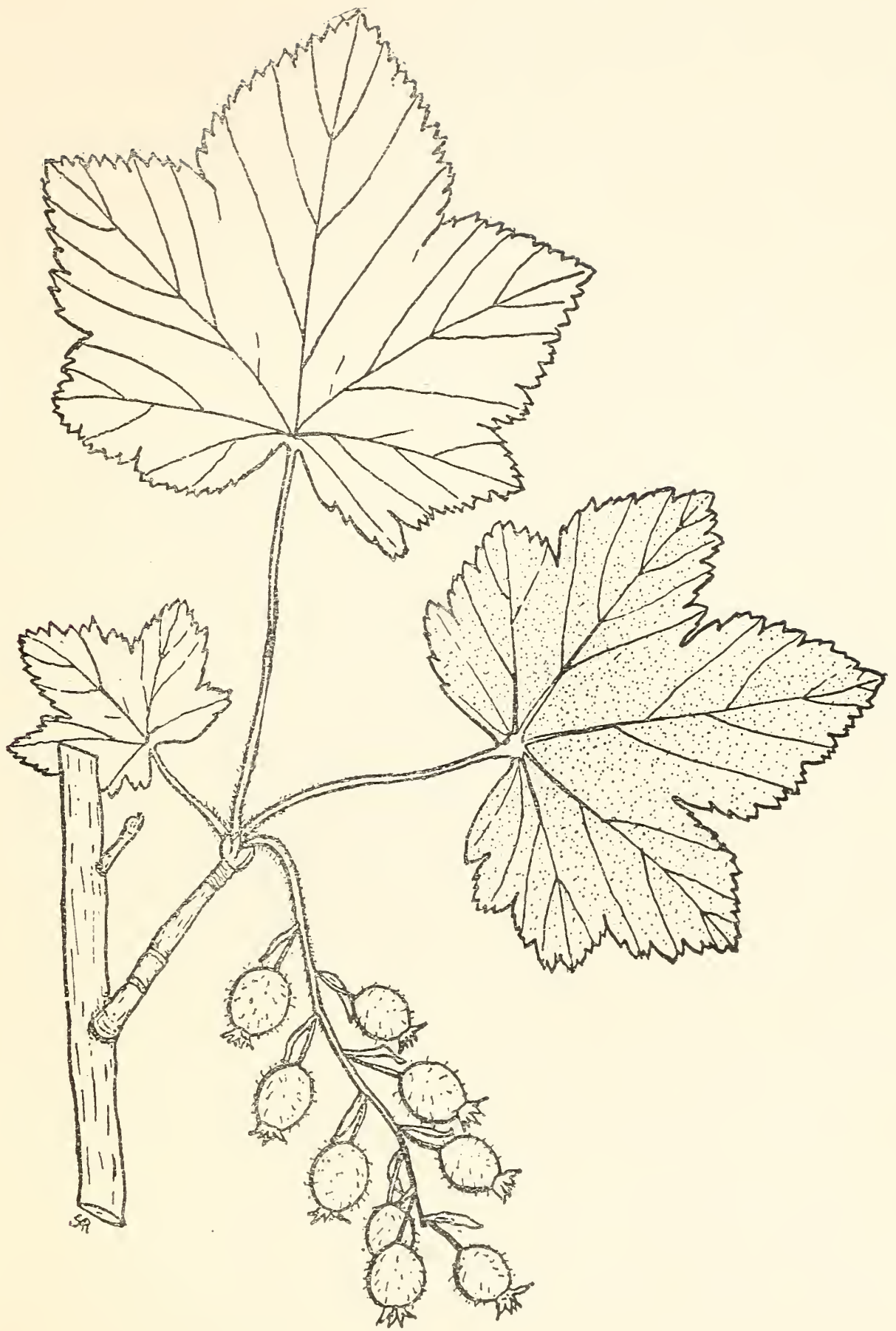
Ribes acerifolium is a shrub not more than 2 meters high, generally erect, sometimes only partially so. The leaves are 3- or 5-lobed, very seldom more than 8 centimeters in width, generally broader than long. The lower surface bears resin-dots which tend to become reddish-brown as the leaf matures, and are sometimes so small as to be scarcely visible without a hand-lens. The fruit-clusters differ from those of *R. bracteosum* and *R. petiolare* in being drooping instead of erect. The fruit is black, with a white bloom when ripe, round, small, sparsely covered with stalked glands. The persistent flower remains are small and saucer-shaped, similar to those of the two preceding species.

When in blossom the flowers are greenish or reddish-green and saucer-shaped.

Note: *R. acerifolium* is the only species having both resin-dots on the lower leaf surfaces and stalked glands on the fruit. It can be distinguished from all other species by the presence of these two characters together.

HABITAT AND DISTRIBUTION. *Ribes acerifolium* occurs only at high altitudes in the Olympics and Cascades. It is abundant near timber-line in these mountains.

SYNONYM: *Ribes howellii* Greene.



Ribes acerifolium Howell.



Ribes sanguineum Pursh.

4. RIBES SANGUINEUM PURSH

Ribes sanguineum is a very erect shrub sometimes 3 meters high. The leaves are 3- or 5-lobed, seldom exceeding 10 centimeters in width. The upper surface is dark green and minutely hairy, while the lower surface is whitish with a dense covering of white, woolly matted hairs. This is the thickest covering of hairs known on the leaves of any *Ribes* occurring in Washington, and is very characteristic of this species. The fruit-cluster is quite loose, either drooping or erect. The fruit is black, with a whitish bloom when ripe, round, somewhat larger than in the several preceding species, and sparsely covered with brownish, short-stalked glands. The persistent flowers while small are tubular instead of saucer-shaped, as in the preceding species.

When in blossom the flowers are red and tubular.

Note: distinguish *R. sanguineum* from the three preceding species by the absence of resin-dots on the lower leaf surface, and from the following species, *R. laxiflorum*, by its erect habit of growth and by the dense woolly hair covering on the lower leaf surface.

HABITAT AND DISTRIBUTION. *Ribes sanguineum* grows on the dryer half-open slopes of the humid region of western Washington, where it is one of the commonest *Ribes* found. It is commonly known as the "red flowering currant".

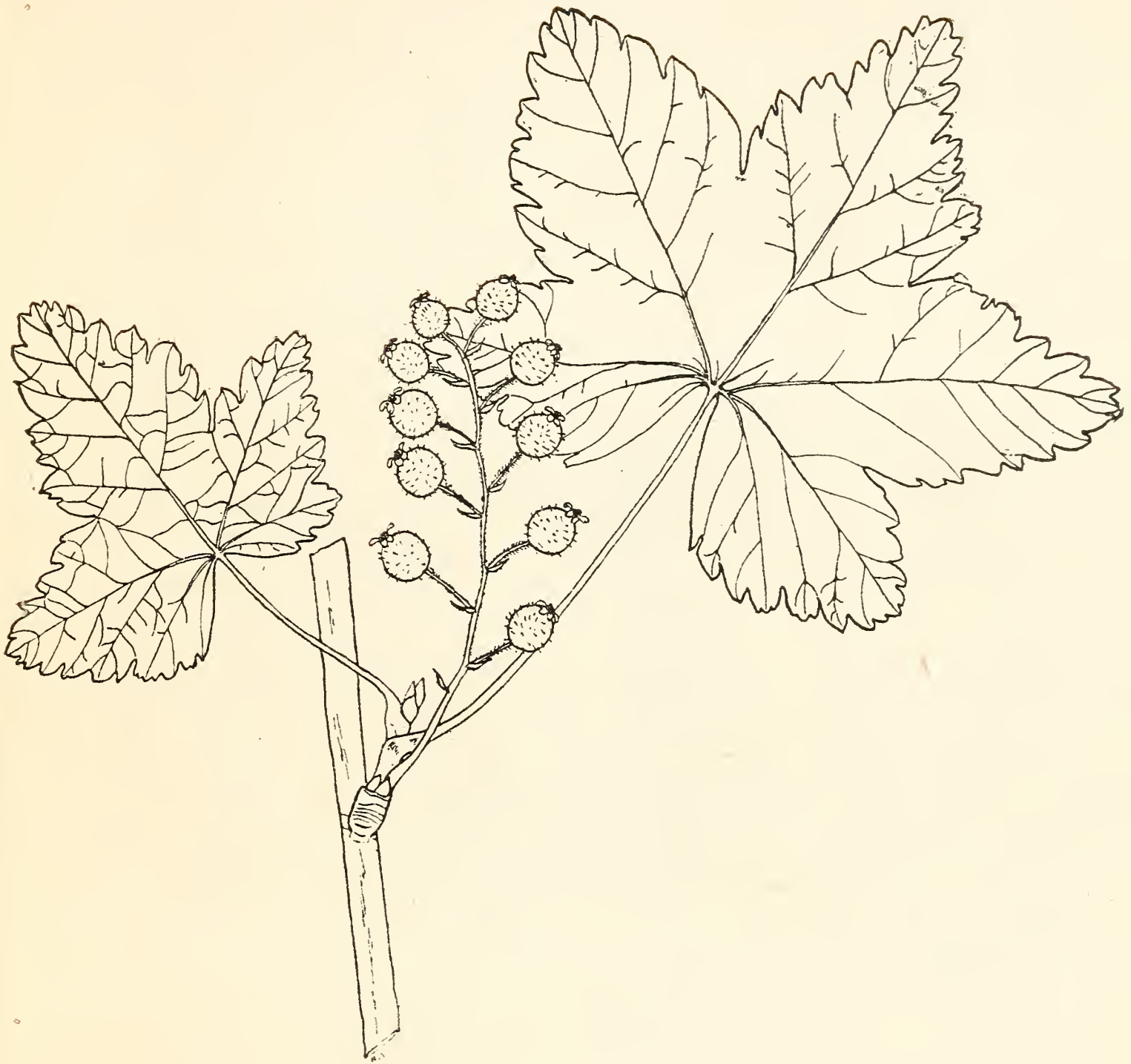
5. RIBES LAXIFLORUM PURSH

Ribes laxiflorum is a low, spreading shrub, the branches reclining on the ground with their ends curved upward. The leaves are 8 centimeters or sometimes 10 centimeters wide, 5- or occasionally 7-lobed, the lobes coarsely toothed, smooth above, slightly hairy along the veins or smooth beneath. The fruit-clusters are erect, with the fruit loosely borne on quite long individual stalks. The fruit is purplish-black, round, much smaller than those of *R. sanguineum*, sparsely covered with long-stalked glands of a deep reddish-brown color. The persistent flowers are small, saucer-shaped instead of tubular.

When in blossom the flowers are whitish, often tinged with red or green, saucer-shaped.

Note: compare material with the description of *R. sanguineum*, as to habit of growth and hairiness of the lower leaf surface; also compare with the description of *R. aureum*, as to habit of growth and presence or absence of stalked glands on the fruit.

HABITAT AND DISTRIBUTION. *Ribes laxiflorum* is a shade loving species found in moist, deep woods. It occurs only in the humid region of western Washington, and on the upper east slopes of the Cascades.



Ribes laxiflorum Pursh.



Ribes aureum Pursh.

6. RIBES AUREUM PURSH

Ribes aureum is an erect shrub 1 to 2 meters high. The leaves may be wedge-shaped at the base and only half as wide as long, or they may be straight across at the base, and much wider than long. All gradations are found between these two extreme shapes. The leaves do not exceed 5 centimeters in width, are 3- or 5-lobed with the lobes only coarsely few-toothed, and without hairs. The fruit-clusters are short, at least the longer ones drooping. The fruit is smooth, round, generally a deep yellow, but sometimes black or reddish. The persistent flower is very long, narrowly tubular, often retaining its original yellow color.

When in blossom the flowers are yellow, sometimes tinged with red, long, and narrowly tubular.

Note: *Ribes aureum* is so distinctive that it will not be confused with any other *Ribes*. It occurs in the same general region as *R. cereum*, a red-fruited species, but is easily distinguished from the latter by the shape of and lack of glands on the leaves.

HABITAT AND DISTRIBUTION. *Ribes aureum* characteristically grows in open, rather arid regions, but in spots where there is considerable available soil moisture, such as banks of streams, or at the bases of steep bluffs. It is quite generally distributed over the lower portions of the semi-arid region of eastern Washington.

Ribes aureum is commonly known as "yellow flowering currant". It is quite similar to *R. odoratum*, a species of yellow flowering currant sometimes cultivated in Washington. The latter, however, has larger leaves with more sharply pointed teeth, and more hairy fruit-stalks and leaf-stalks than *R. aureum*.

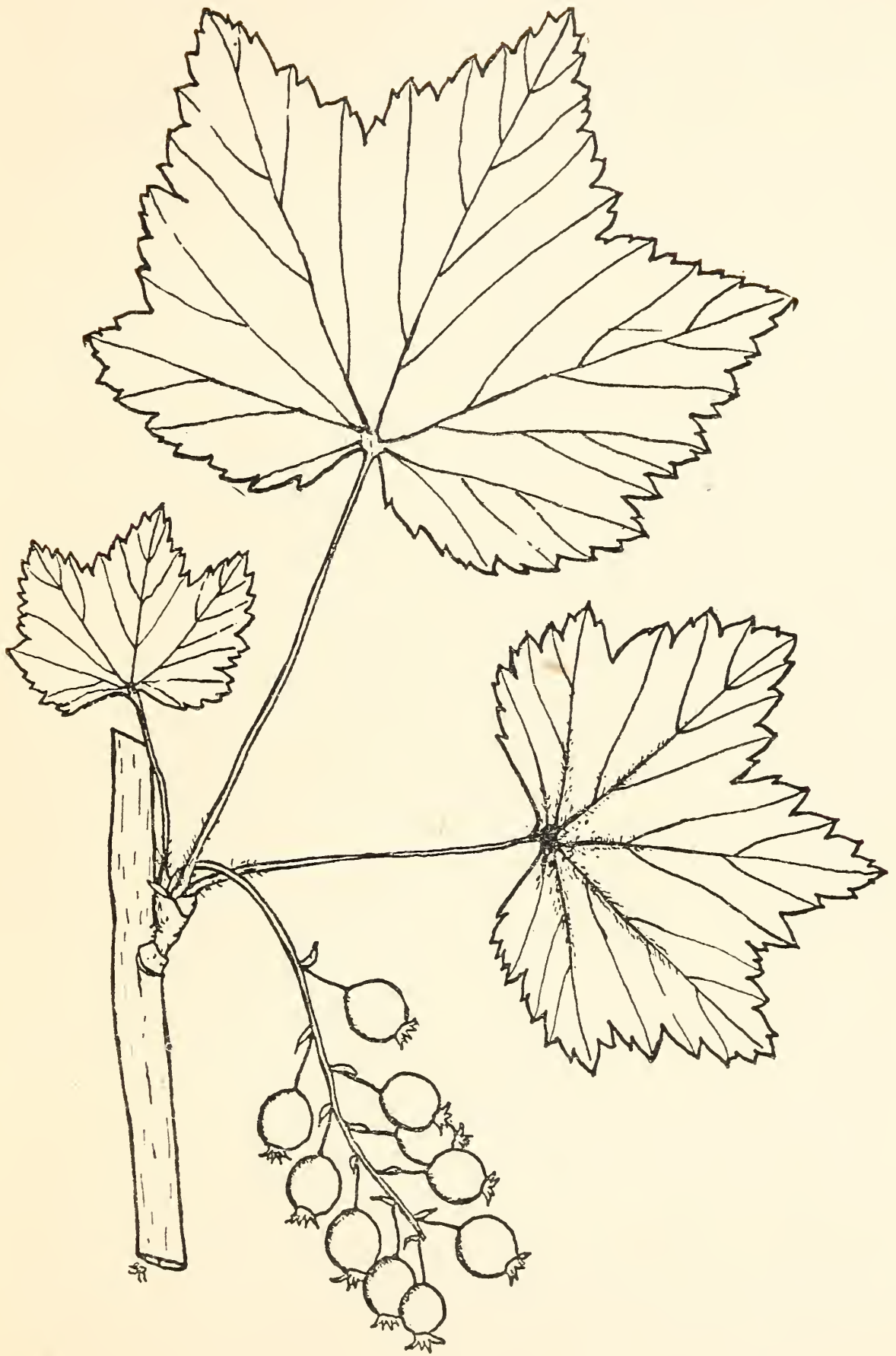
7. RIBES TRISTE PALL.

Ribes triste is a very low shrub, the branches trailing along the ground or rising obliquely. The young stems are smooth and reddish-brown. The leaves are thin, broader than long, not more than 10 centimeters wide, 3- or occasionally 5-lobed, the lobes broad but coming to a sharp point, the margin sharply toothed, and the base deeply heart-shaped. They are smooth above and often have some coarse hairs along the veins on the lower surface. The fruit-clusters are drooping, bearing 6 to 10 round, smooth, red fruit. The persistent flowers are small and saucer-shaped.

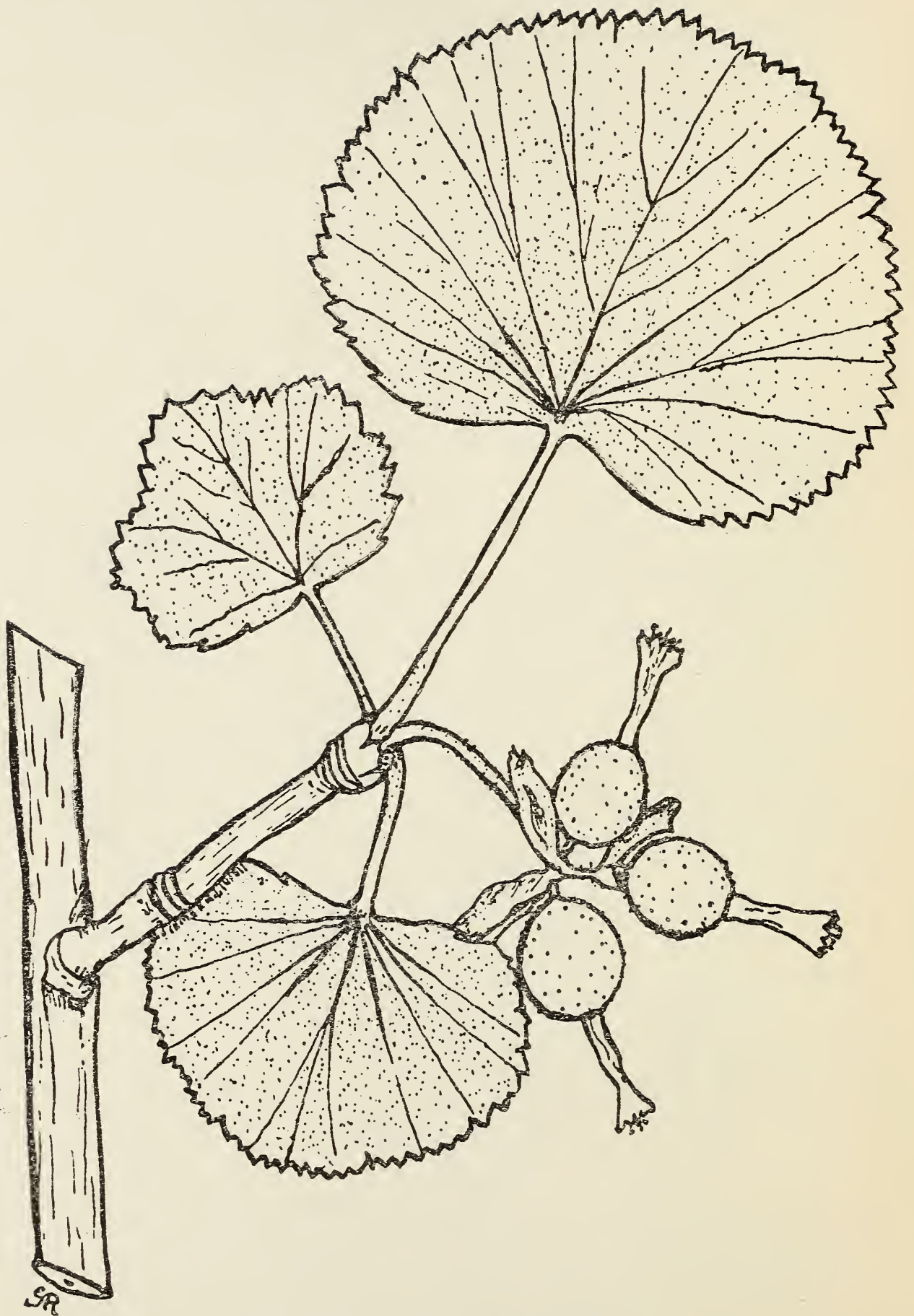
When in blossom the flowers are purple or greenish-purple and saucer-shaped.

Note: compare material with description of *R. aureum*, as to leaf shape, and *R. cereum*, as to leaf shape and presence or absence of stalked glands on the leaves.

HABITAT AND DISTRIBUTION. *Ribes triste* occurs only in the southern Cascades principally on the upper east slopes in shaded situations. It is a rather uncommon species.



Ribes triste Pall.



Ribes cereum Dougl.

Ribes triste is closely related to the cultivated red currant, and resembles it closely in appearance of the leaves and fruit.

SYNONYMS: *Ribes ciliosum* Howell.
Ribes migratorium Suksd.

8. RIBES CEREUM DOUGL.

Ribes cereum is a compact, much branched shrub, generally not more than 1 meter, but occasionally 2 meters high. The leaves are gray-green in color, often covered with a whitish waxy substance, small, never exceeding 4 centimeters in width and generally much less, round, 3- or 5-lobed, the lobes rounded, with the margins round-toothed. They are finely glandular, and often finely hairy on both surfaces. The fruit-stalks are short, drooping, bearing few fruit. The fruit is round, bright or sometimes deep red, with or without glands. The persistent flowers are long and tubular, but not as narrowly so as those of *R. aureum*.

When in blossom the flowers are white or sometimes pink and narrowly tubular.

Note: compare material with description of *R. triste* as to presence or absence of stalked glands on the leaves, and the leaf size; compare also with the description of *R. viscosissimum* as to color of the fruit.

HABITAT AND DISTRIBUTION. *Ribes cereum* is a dry-land plant, generally growing in the open.

It is widely distributed over the semi-arid region of eastern Washington.

SYNONYMS: *Ribes inebrians* Lindl.
Ribes reniforme Nutt.

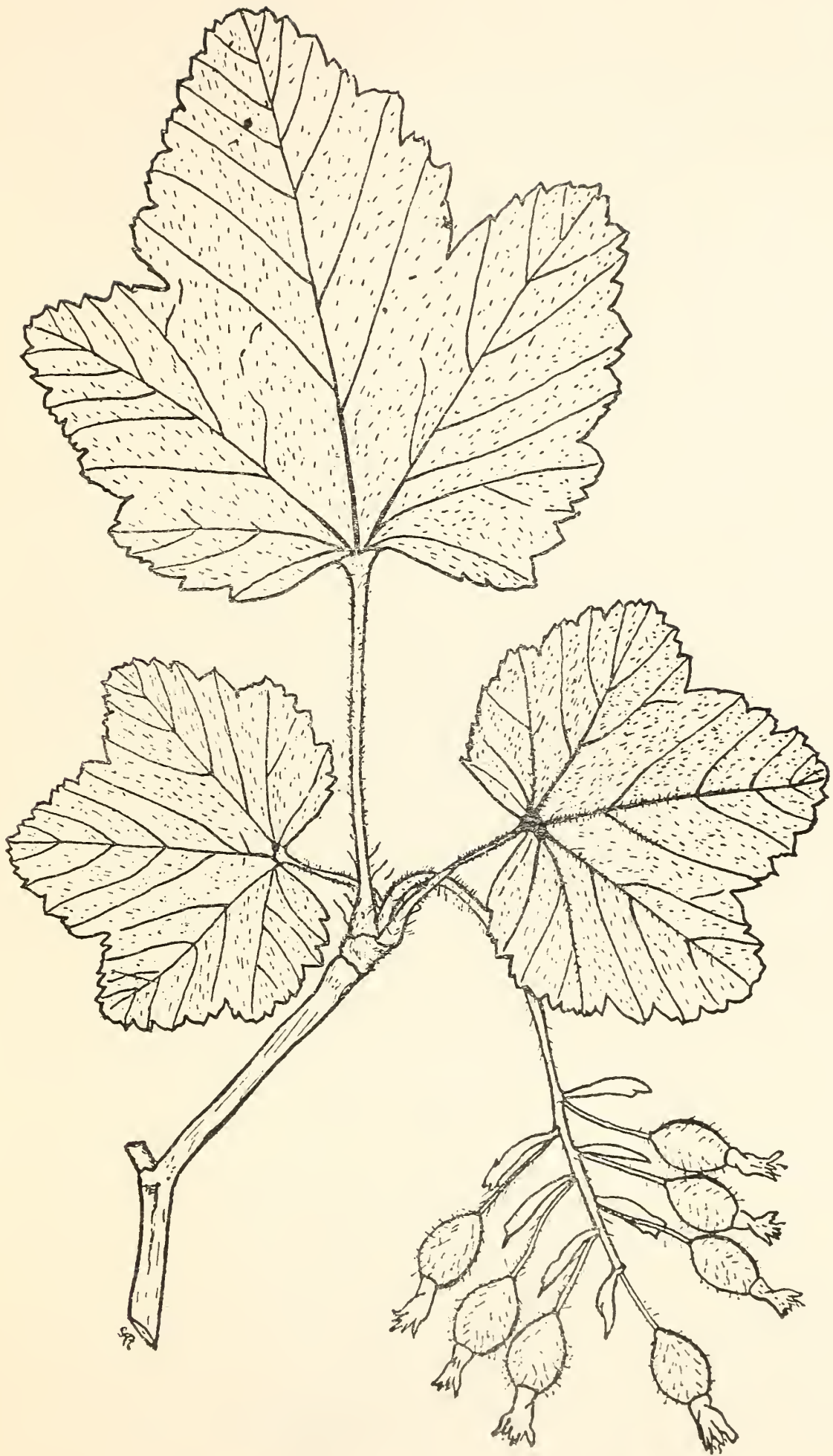
9. RIBES VISCOSISSIMUM PURSH

Ribes viscosissimum is a low shrub, not more than 1 meter high, erect or somewhat spreading. The leaves are rounded or broader than long, not more than 8 centimeters wide, 3- or 5-lobed, the lobes broad. The upper surface is a much darker green than the lower. Both surfaces bear numerous stalked glands, and the lower surface is densely hairy while the upper is only sparsely so. The fruit-clusters are quite short, bearing 3 to 6, or occasionally 8 fruit. The fruit is black, without bloom, oval rather than round, and bearing numerous stalked glands. The persistent flowers are larger than in any of the preceding species, tubular, but very broadly so.

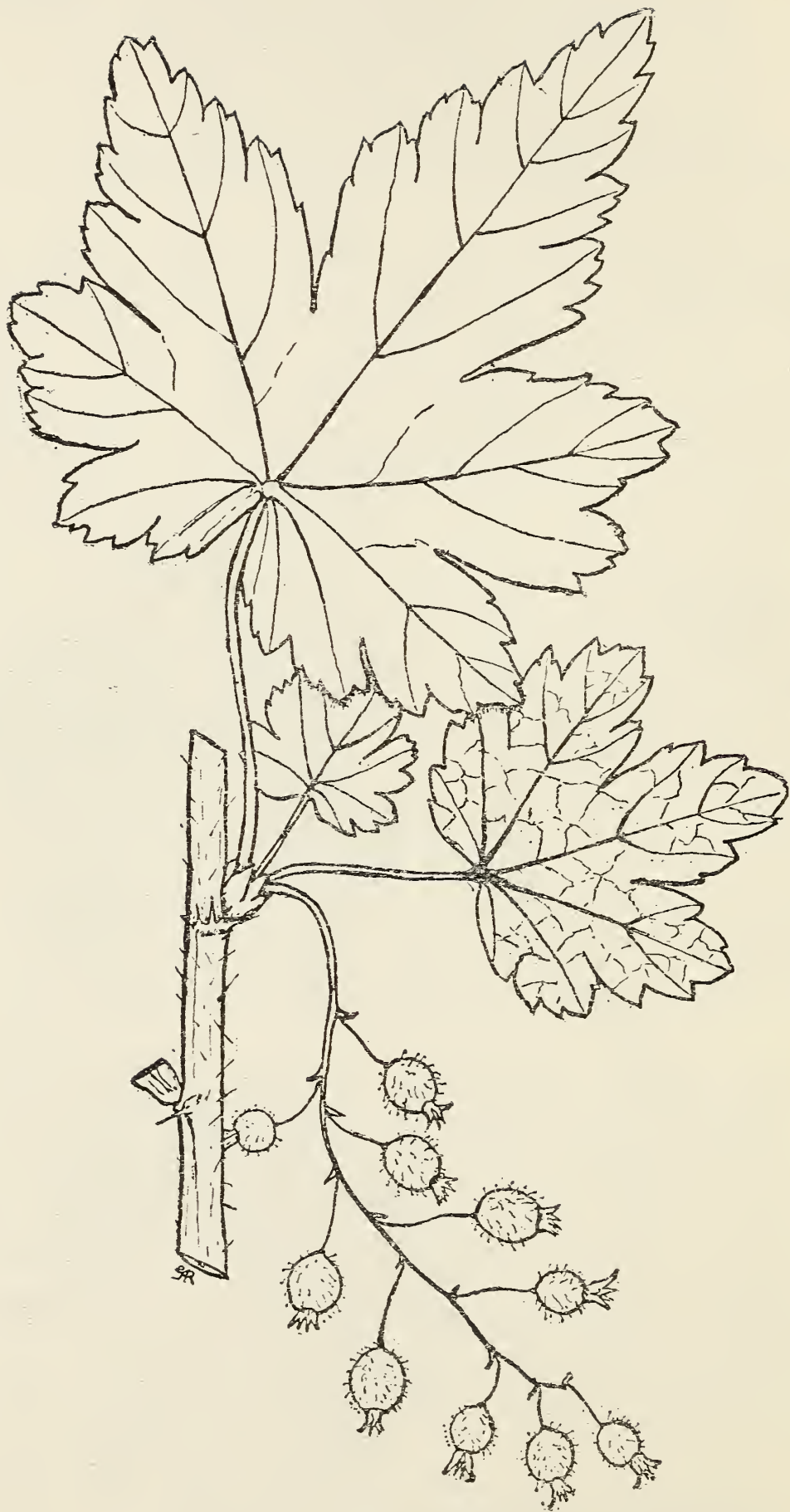
When in blossom the flowers are light green or purplish and broadly tubular.

Note: compare material with description of *R. cereum*, a species found under similar site conditions and which also has stalked glands on the leaves and sometimes on the fruit. They can be readily distinguished by the color of the fruit.

HABITAT AND DISTRIBUTION. *Ribes viscosissimum* generally grows in the shade but in



Ribes viscosissimum Pursh.



Ribes lacustre (Pers.) Poir.

fairly dry soil. It is widely distributed in the yellow pine forests in the semi-arid region of eastern Washington, on the dryer wooded slopes. It also occurs to some extent in the Blue Mountains.

10. RIBES LACUSTRE (PERS.) POIR.

Ribes lacustre is one of the two species of spiny currants. It is an erect shrub, 1 or occasionally 2 meters high. The stems and branches bear slender spines at the nodes, varying in number from 1 to 6, and often have numerous spines between the nodes. The leaves are longer than broad, or sometimes round in general outline, seldom exceeding 6 centimeters in width, deeply 5- or sometimes 7-lobed, the lobes narrow and pointed rather than round, and deeply toothed. Both leaf surfaces are smooth, without hairs or glands. The fruit-clusters are loose and drooping, with slender stalks. The fruit is a deep purplish-black, round, bearing very long and weak-stalked glands. The persistent flowers are short and saucer-shaped, instead of tubular.

When in blossom the flowers are light green or purplish and saucer-shaped.

Note: *Ribes lacustre* can be distinguished from the gooseberries, which are also spiny, by the test described on pp. 3. The material should be compared with the description of *R. montigenum*, the other spiny currant, as to fruit color and hairs and glands on the leaves.

HABITAT AND DISTRIBUTION. *Ribes lacustre* is a moisture loving plant, growing in swampy places, river bottoms, and moist woods. It is widely distributed over Washington, occurring both in the humid region of western Washington and in the yellow pine forests in the semi-arid region of eastern Washington.

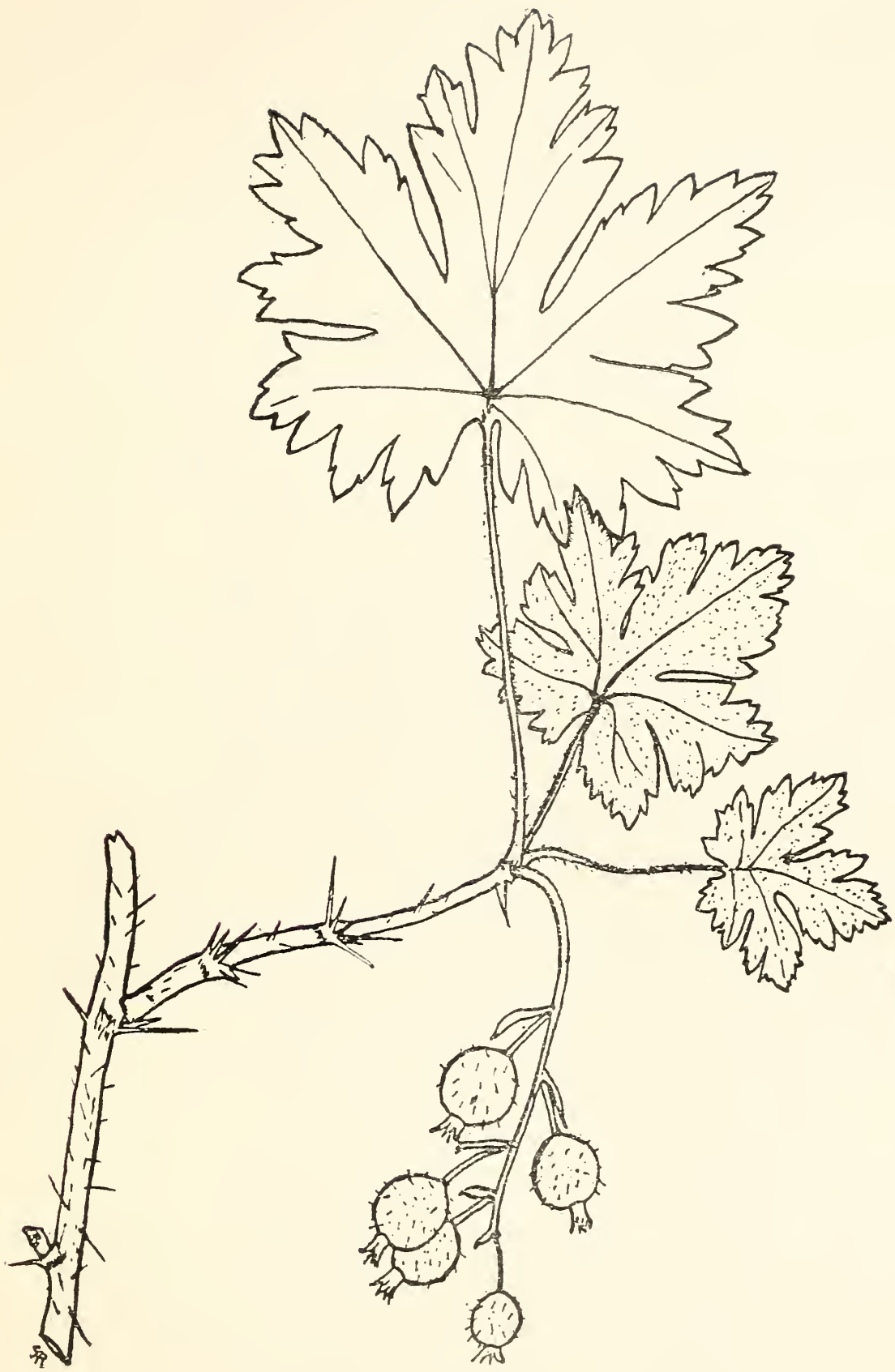
SYNONYM: *Ribes parvulum* Rydb.

11 RIBES MONTIGENUM McCLATCHIE

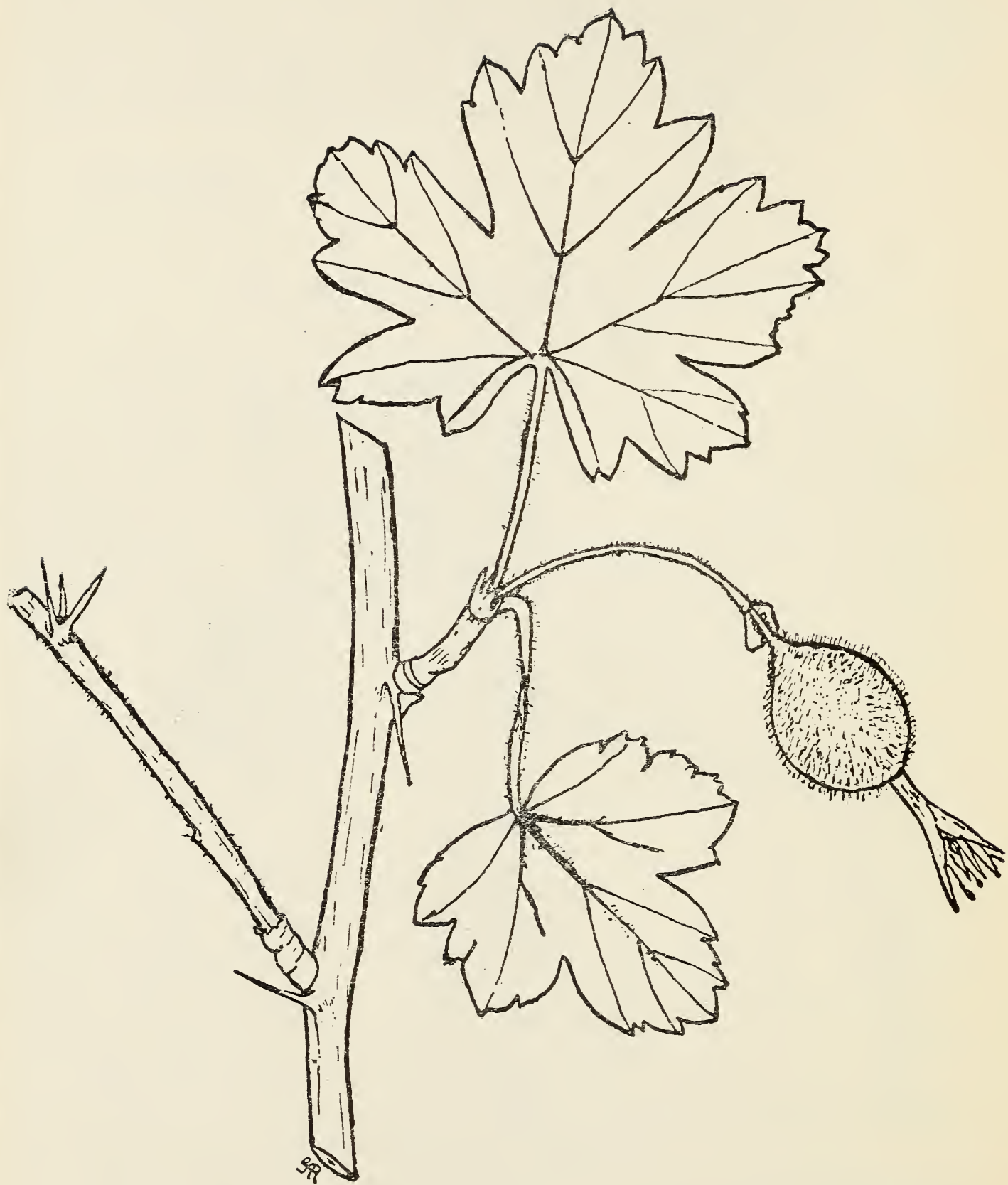
Ribes montigenum, one of the two species of spiny currants, is a low straggling shrub, not more than 1 meter high. The stems and branches bear spines similar to those of *R. lacustre*. The leaves are much smaller than in *R. lacustre*, never exceeding 4 centimeters in width. They are very deeply 5-lobed, with the lobes increasing in width above their lowest point, and again decreasing so that they are elliptical in general outline. The margins of these lobes are deeply toothed. Both leaf surfaces are hairy and glandular. The fruit is similar in size and shape and character of glands to that of *R. lacustre*, but is red. The persistent flower is small and saucer-shaped.

When in blossom the flowers are greenish to purplish and saucer-shaped.

Note: *Ribes montigenum* can be distinguished from the gooseberries by the method described on pp. 3. The material should be compared with the description of *R. lacustre*, as to fruit color, and glands and hairs on



Ribes montigenum McClatchie.



Grossularia lobbii (A.Gray) C. & B.

the leaves.

HABITAT AND DISTRIBUTION. *Ribes montigenum* is a characteristically high altitude plant, growing in dry situations. It is uncommon in Washington, but is occasionally found in dry spots at high altitudes.

SYNONYMS: *Ribes molle* Howell

Ribes lentum Coville and Rose.

12. GROSSULARIA LOBBII (A. GRAY) C. & B.

Grossularia lobbii is a stiff, erect shrub, 1 to 2 meters high, the stems and branches bearing 1 to 3 strong spines at the nodes, and occasionally spiny between the nodes. The leaves are round or somewhat longer than broad, not exceeding 4 centimeters in width, 3- or 5-lobed, with coarse hairs and numerous stalked glands especially along the veins and margins on the lower surface, less glandular and hairy on the upper surface. The fruit-clusters are drooping, bearing 1 to 3 fruit. The fruit is brown to brownish-purple, oval in shape, 1 to 1.5 centimeters long, very densely covered with reddish-brown, rather short-stalked glands. The persistent flower is quite tubular, curving back above the tube.

When in blossom the flowers are deep purplish-red, tubular, quite long, conspicuous.

Note: *Grossularia lobbii*, being a gooseberry can be distinguished from the spiny currants by the method described on pp. 3. The dense covering of short-stalked glands on the fruit

also serves to distinguish it from all other species of Ribes, whether currants or gooseberries.

HABITAT AND DISTRIBUTION. *Grossularia lobbii* grows on open, brushy slopes in the humid region of western Washington. It is commoner in southern than in northern Washington.

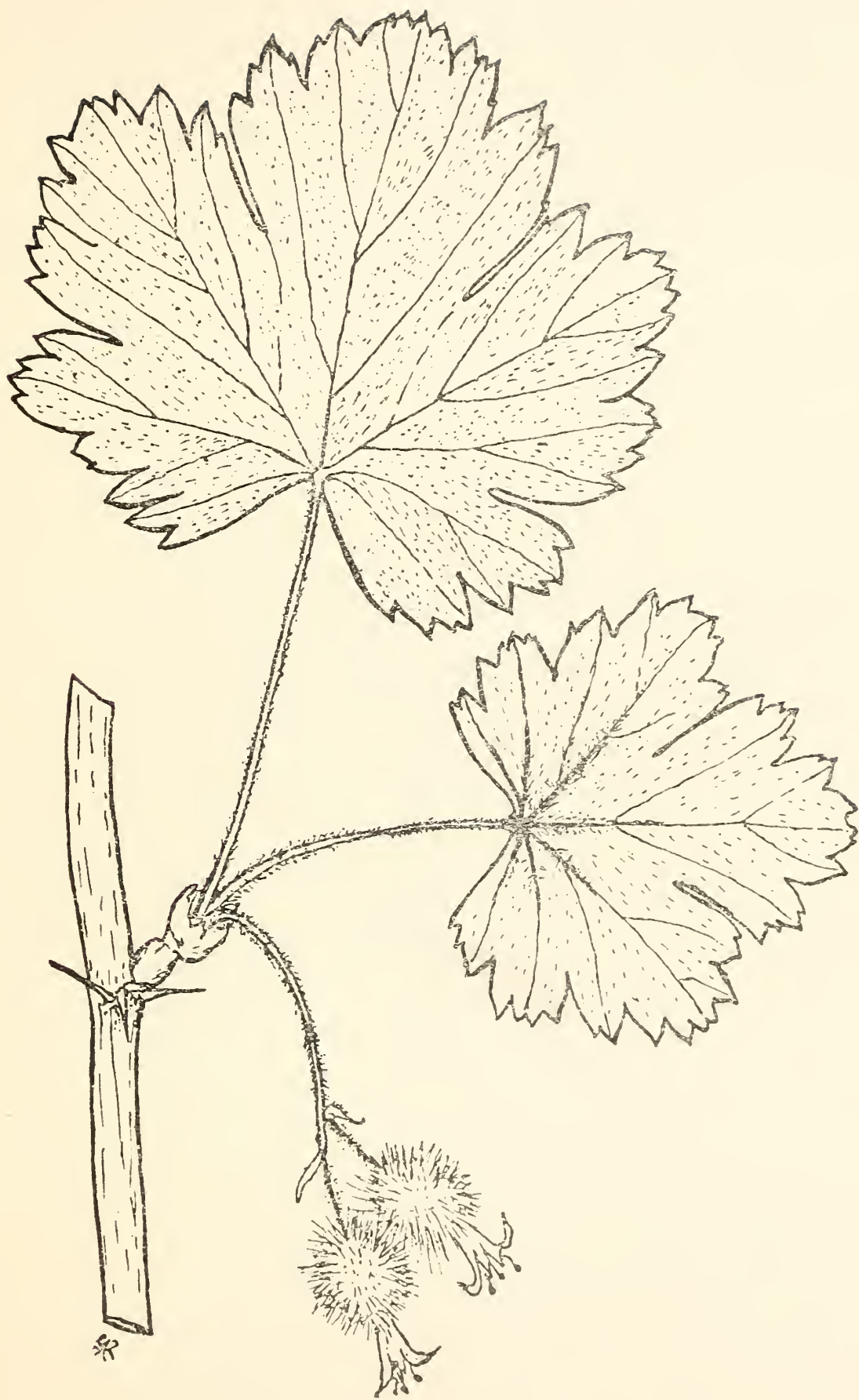
SYNONYM: *Ribes lobbii* A.Gray.

13. GROSSULARIA WATSONIANA (KOEHNE) C. & B.

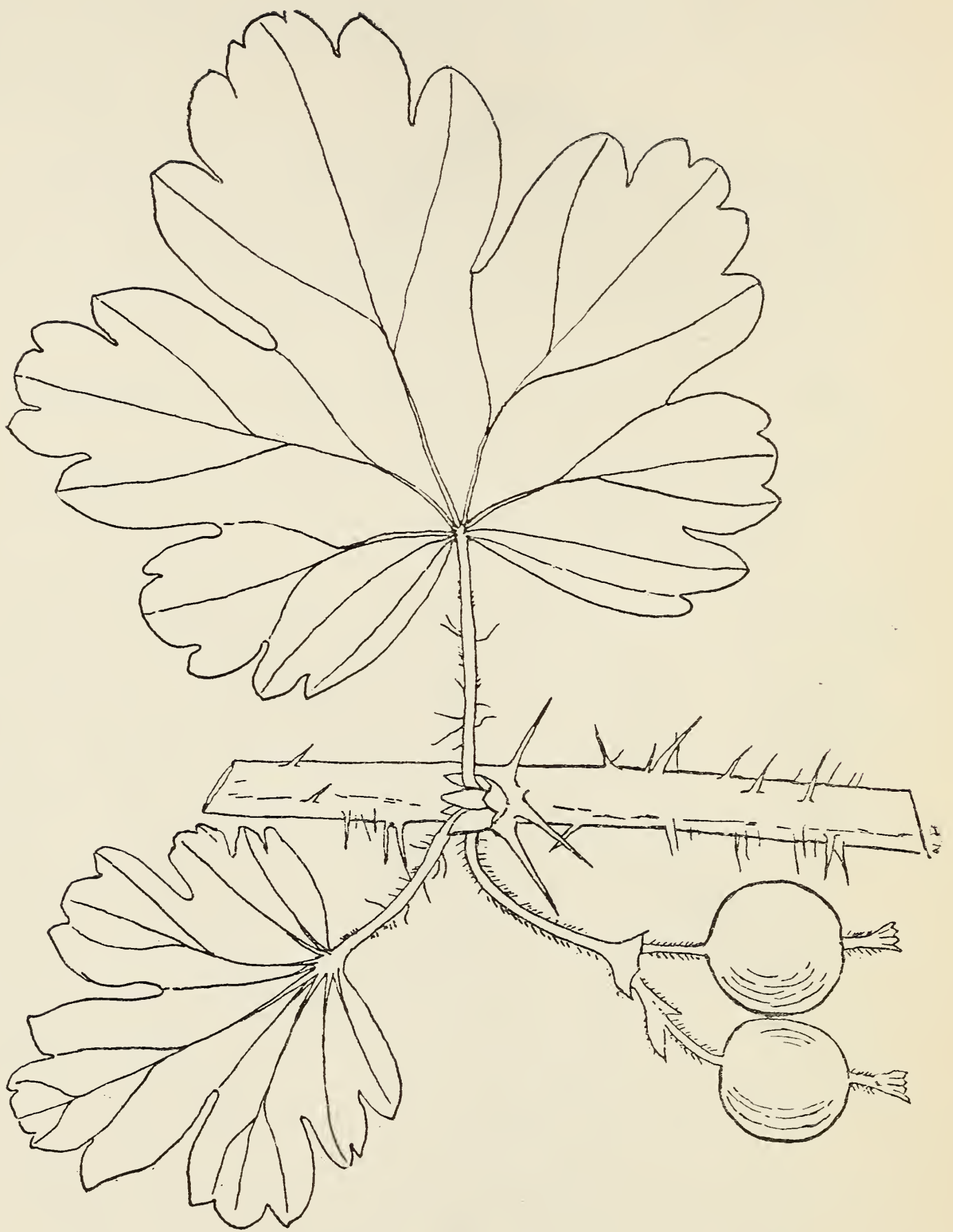
Grossularia watsoniana is a shrub with erect or upwardly curved stems, the stems and branches bearing usually triple, rather stout spines at the nodes, and seldom any between the nodes. The leaves are round in outline, deeply cut into 5 or sometimes only 3 lobes, the lobes deeply toothed. Both surfaces are sparsely hairy and bear stalked glands, at least along the veins. The fruit-clusters bear 1 to 3 fruit, and are drooping. The fruit is round and is densely covered with long, sharp, yellowish-brown prickles, some of the shorter of which have glands at their tips. The persistent flowers are whitish, tubular, spreading above the tube.

When in blossom the flowers are greenish-white and tubular.

Note: *Grossularia watsoniana* is the only Ribes found in Washington which has prickles on the fruit, and can be readily distinguished by this fact.



Grossularia watsoniana (Koehne) C. & B.



Grossularia cognata (Greene) C. & B.

HABITAT AND DISTRIBUTION. *Grossularia watsoniana* is a relatively rare species found only at high altitudes of the humid region, in the Cascades. It is a shade loving plant, growing in moist soil in the woods.

SYNONYMS: *Ribes watsonianum* Koehne
Ribes ambiguum S.Wats. (in part).

14. GROSSULARIA COGNATA (GREENE) C. & B.

Grossularia cognata is an erect but much branched shrub, often 3 meters high. The stems and branches have slender spines at the nodes, usually triple. The young branches are grayish in color, finely and densely hairy, and bearing few to many weak spines between the nodes. The leaves are somewhat broader than long, not exceeding 6 centimeters in width, 5-or sometimes 3-lobed, with the margins rather coarsely toothed. Both the lower and the upper surfaces bear very small stalked glands, visible only with a hand lens, and are hairy, generally more so below than above. The fruit-clusters are drooping, bearing 2 to 5 fruit, which are round, smooth, and purplish-black. The persistent flower is narrowly tubular, spreading above the lobes.

When in blossom the flowers are white or sometimes pinkish, tubular and hairy.

Note: compare the material with the description of *G. irrigua*, as to presence or absence of spines between the nodes of the young branches.

HABITAT AND DISTRIBUTION. *Grossularia cognata* occurs only in the semi-arid region of extreme eastern Washington.

SYNONYM: *Ribes cognatum* Greene

15. GROSSULARIA IRRIGUA (DOUGL.) C. & B.

Grossularia irrigua is an erect shrub, 1-3 meters high. The stems and branches bear rather weak spines at the nodes, and numerous weak spines between the nodes on the older stems, these latter being wanting on the light colored young branches. The leaves are round in general outline, sometimes 7 centimeters wide, mostly 5- but sometimes 3-lobed, finely hairy below and somewhat so along the veins above, and finely glandular. The fruit-clusters are short, drooping, bearing 1 to 3 fruit. The fruit is dark reddish-purple or nearly black, round and smooth. The persistent flower is broadly tubular.

When in blossom the flowers are greenish-white, tubular and hairless.

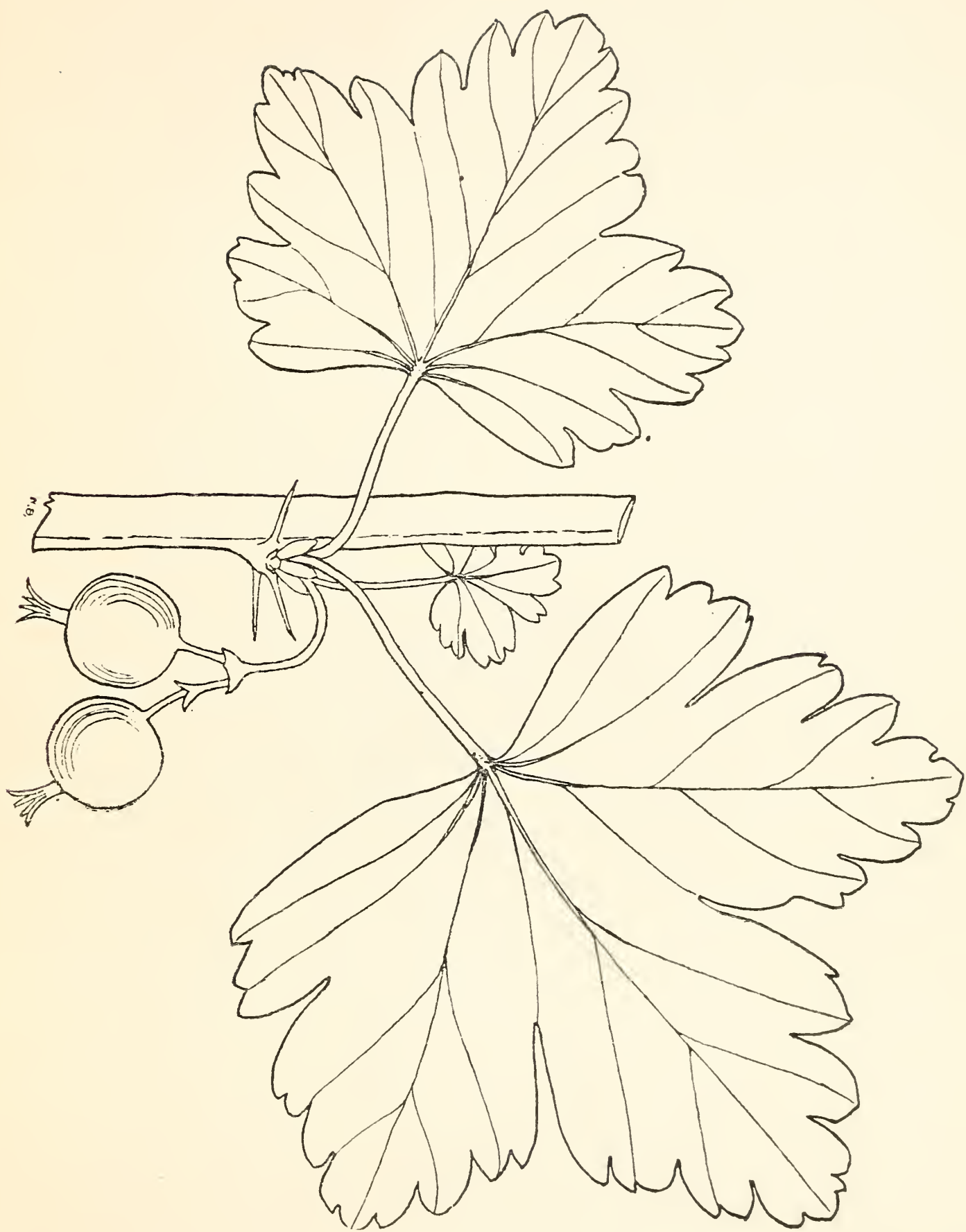
Note: compare material with description of *G. cognata*, as to the presence or absence of spines on the young branches.

HABITAT AND DISTRIBUTION. *Grossularia irrigua* occurs only in the semi-arid region in extreme eastern Washington.

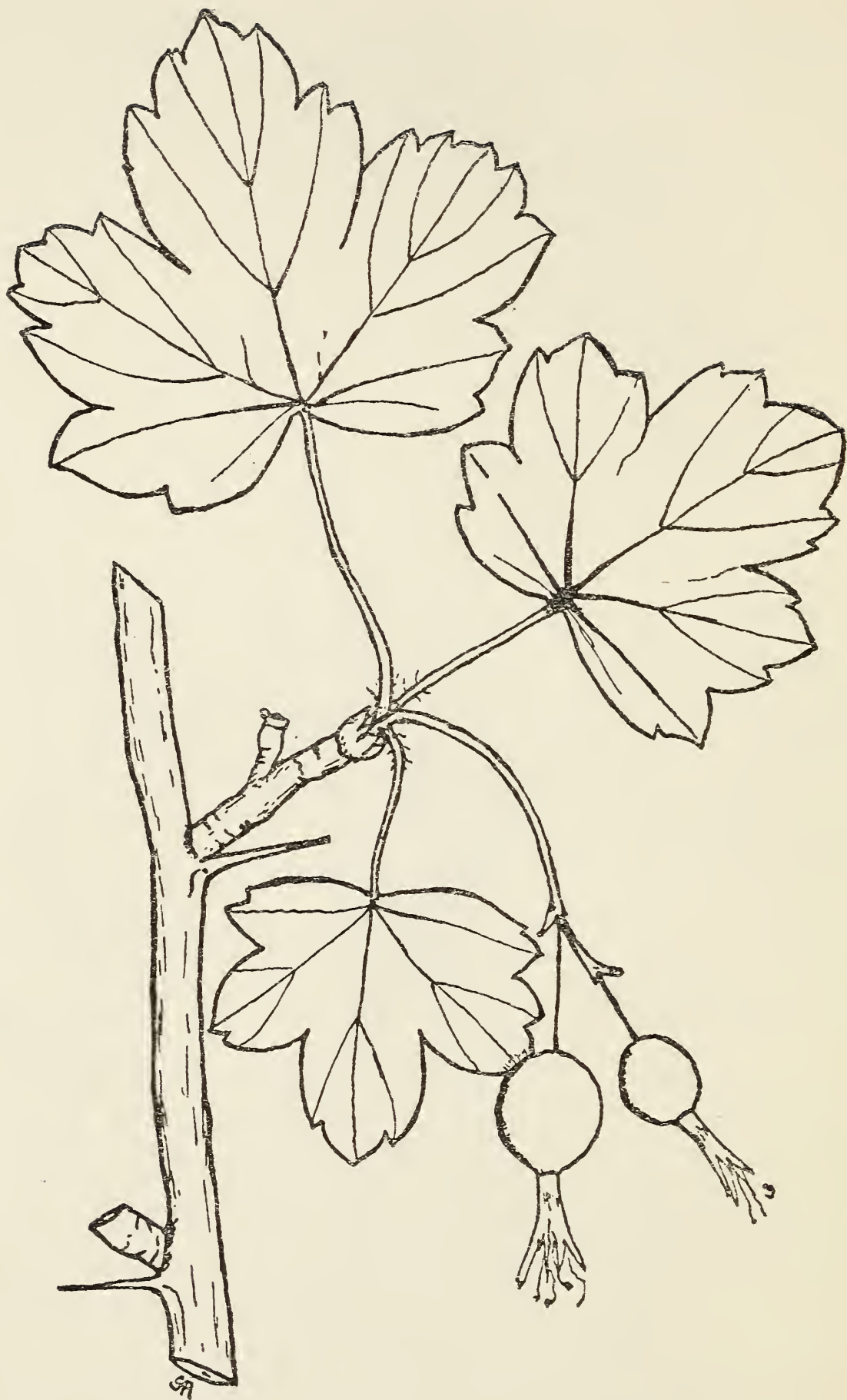
SYNONYMS: *Ribes irriguum* Dougl.

Ribes divaricatum irriguum A. Gray

Ribes leucoderme Heller



Grossularia irrigua (Dougl.) C. & B.



Grossularia nivea (Lindl.) Spach

16. GROSSULARIA NIVEA (LINDL.) SPACH

Grossularia nivea is an erect or obliquely ascending shrub, never exceeding 3 meters in height. The stems and branches are smooth except for the long, stout, nodal spines, which are generally borne singly. The one-year old branches are reddish-brown in color, and without spines between the nodes. The leaves are round in outline, not exceeding 4 centimeters in width, wedge-shaped to straight across at the base, 3-5-lobed, with a few coarse teeth, either hairy or smooth on both surfaces, except that at the base on the under side there are always a few hairs. The fruit-clusters bear 1 to 4 fruit, and are drooping. The individual fruit-stalks are quite long, often 5 to 10 millimeters. The fruit is black or nearly so, smooth, round. The persistent flower is short-tubular, with long lobes above the tube.

When in blossom the flowers are white and tubular. The individual flower-stalks are slender and quite long.

Note: compare material with descriptions of *G. divaricata* and *G. inermis*, as to leaf-shape and color of young branches; also with descriptions of *G. cognata* and *G. irrigua*, as to presence or absence of stalked glands on the leaves.

HABITAT AND DISTRIBUTION. *Grossularia nivea* occurs along streams in the semi-arid region of extreme southeastern Washington. It is more frequently found on the banks of the Snake River, but should be expected along any

of the lower streams in that region.

SYNONYM: *Ribes niveum* Lindl.

17. GROSSULARIA DIVARICATA (DOUGL.) C. & B.

Grossularia divaricata is an erect shrub, often 3 meters high. The stems and branches bear 1 to 3 spines at the nodes which are often very stout, strong, and 15 millimeters in length. The young branches are gray to brown and only occasionally bear spines between the nodes. The leaves are round in outline, not exceeding 6 centimeters in width, generally 5- but sometimes only 3-lobed, with the margins sharply toothed. The lower surface is invariably sparsely covered with long, coarse hairs, and these are frequently, but not always found on the upper surface. The fruit-clusters are drooping, bearing 1 to 4 fruit. The fruit is black or dark purple, round and smooth. The persistent flower is short-tubular, spreading above the tube.

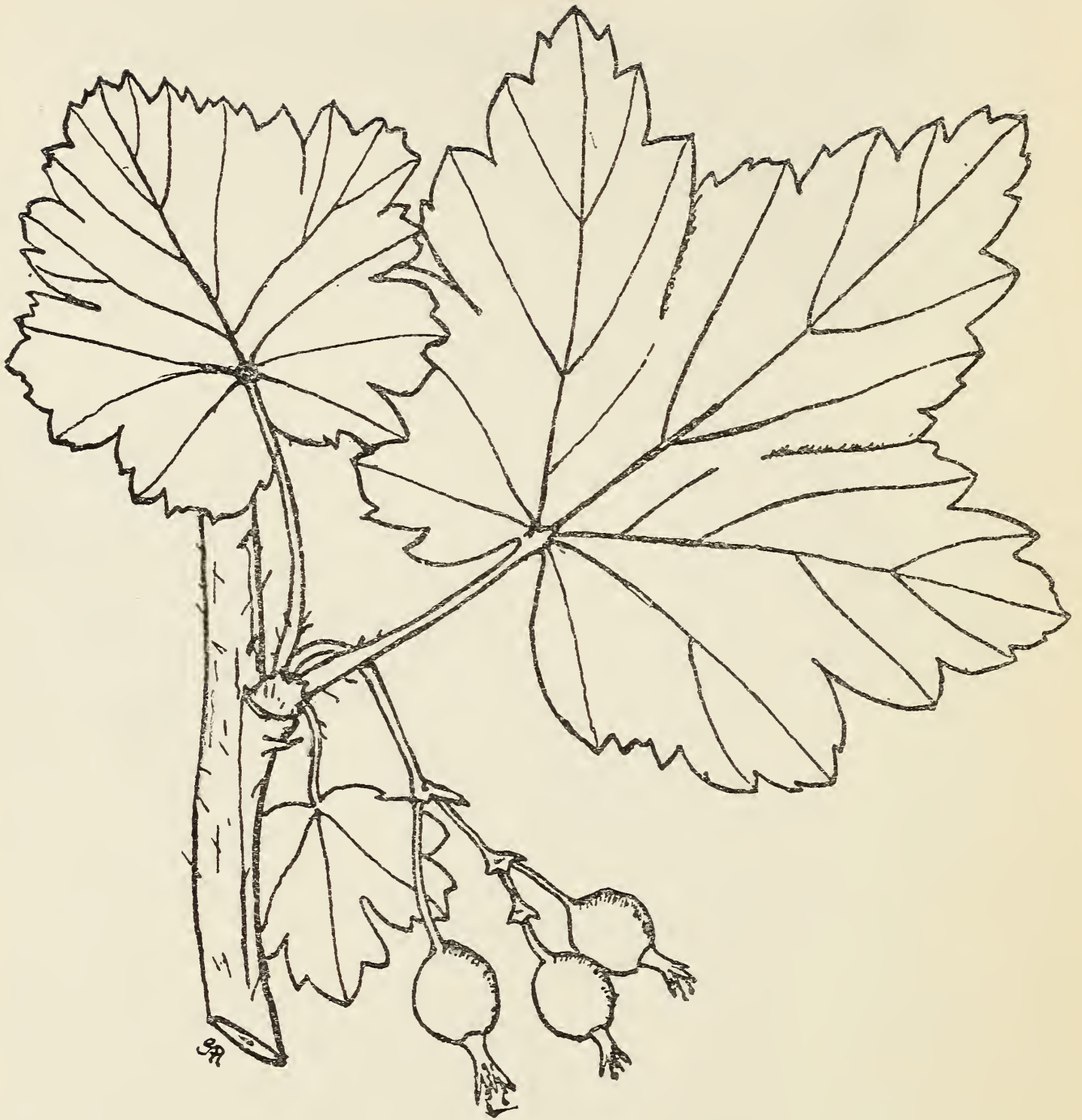
When in blossom the flowers are light green, sometimes tinged with purple, and are shortly and broadly tubular.

Note: compare material with description of *G. inermis*, as to presence or absence of spines on the stems and hairs on the leaves; also with description of *G. nivea*, as to leaf-shape and color of the young branches.

HABITAT AND DISTRIBUTION. *Grossularia divaricata* is a shade and moisture loving plant, occurring only in the humid region of western



Grossularia divaricata (Dougl.) C. & B.



Grossularia inermis (Rydb.) C. & B.

Washington.

SYNONYMS: *Ribes divaricatum* Dougl.
Ribes villosum Nutt.
Ribes Suksdorfii Heller

18. GROSSULARIA INERMIS (RYDB.) C. & B.

Grossularia inermis is an erect but rather low shrub, 1 to 1.5 meters high. The grayish stems and branches are only occasionally armed with spines either at or between the nodes. A careful search will, however, always show that a few spines are present. The leaves are round or somewhat broader than long, thin, 3-5-lobed, with the lobes sharp, toothed, generally without hairs on either surface, but occasionally slightly hairy below. The fruit-clusters are drooping, bearing 1 to 4 fruit. The fruit is dark purplish, round, smooth. The persistent flower is short-tubular, spreading above the tube.

When in blossom the flowers are greenish, sometimes tinged with purple, and are shortly and broadly tubular.

Note: compare material with description of *G. divaricata*, as to presence or absence of spines on the stems and hairs on the leaves; also with description of *G. nivea*, as to leaf-shape and color of the young branches.

HABITAT AND DISTRIBUTION. *Grossularia inermis* grows in rather moist or swampy places in the semi-arid region of central and eastern Washington.

SYNONYMS: Ribes inerme Rydb.
Ribes Purpusi Koehne
Ribes vallicola Greene

FLOWER KEY TO THE WASHINGTON RIBES.

The following key, based on vegetative and flower characters, is for use during the spring and early summer months, when the Ribes are in blossom.

1. Plants without spines on the stems and branches.

A. Leaves with numerous yellowish resin-dots on the lower surface. Flowers greenish or whitish, saucer-shaped.

1. Flower-clusters erect. Ovaries bearing resin-dots similar to those on the leaves.

a. Flowers greenish, loosely borne in a very long flower-cluster, the lower bracts of which are leaf-like. Leaves deeply 5-7-lobed, the lobes narrow and sharply pointed. Shade and moisture loving plants of western Washington.....
.....1. *R. bracteosum*.

b. Flowers white, borne in a compact flower-cluster. Bracts very small, all of an equal size. Leaves 3-5-lobed, the lobes broad. Plants occurring only east of the Cascades..
.....
.....2. *R. petiolare*.

2. Flower-clusters drooping. Ovaries bearing stalked glands, but no resin-dots. Plants found only at high altitudes in the Olympics and Cascades

.....
..... *3. R. acerifolium.*

B. Leaves without resin-dots on the lower surface, with or without stalked glands.

1. Leaves without stalked glands, with or without hairs.

a. Flowers tubular, red or yellow.
Plants erect.

(1) Flowers red. Lowerleaf surfaces densely covered with white, woolly, matted hairs. Plants of western Washington, occurring along the coast and at middle altitudes in the mountains.....
..... *4. R. sanguineum.*

(2) Flowers yellow. Leaves without hairs. Plants of the lower, drier regions, east of the Cascades.
..... *6. R. aureum.*

b. Flowers saucer-shaped. Plants reclining on the ground, or rising obliquely

(1) Flowers whitish. Ovaries hairy and generally bearing stalked glands. Plants occurring at low altitudes along the Pacific Ocean, and at middle altitudes in the Olympics and Cascades.....
..... *5. R. laxiflorum.*

(2) Flowers purplish or greenish-purple.

Ovaries without hairs or stalked glands. Plants occurring only at high altitudes in the southern Cascades.....7.*R. triste*.

2. Leaves bearing stalked glands, with or without hairs.

a. Flowers white or pink, narrowly tubular. Leaves grayish-green, not exceeding 4 centimeters in width. Dryland Plants occurring only east of the Cascades.....8.*R. cereum*.

b. Flowers greenish-white, broadly tubular. Leaves deep green, not exceeding 8 centimeters in width. Plants occurring east of the summit of the Cascades, at middle and high altitudes.....9.*R. viscosissimum*.

II. Plants bearing spines on the stems and branches.

A. Ovaries bearing stalked glands or prickles.

1. Flowers saucer-shaped, greenish to purplish. Ovaries bearing long-stalked glands but not prickles.

a. Leaves without hairs or stalked glands. Plants widely distributed over Washington, growing in moist soils.....10.*R. lacustre*.

b. Leaves hairy and with stalked glands on both surfaces. Found only at high altitudes and in dry places in the Cascades.....11.*R. montigenum*.

2. Flowers tubular. Ovaries bearing short-stalked glands or sharp prickles, many of which are gland-tipped.

a. Flowers deep purplish-red. Ovaries bearing short-stalked glands. Plants occurring in western Washington, in the coast and Puget Sound region and on the lower slopes of the Cascades.....
.....*12. G. lobbii.*

b. Flowers greenish-white. Ovaries bearing weak bristles, many of them gland-tipped. Found only in the Cascades above 5000 feet.....
.....*13. G. watsoniana.*

B. Ovaries without stalked glands or prickles, occasionally with hairs.

1. Leaves bearing very fine stalked glands at least on the lower surface, and hairy, more so on the lower than upper surface. Flowers tubular, white, pinkish or greenish-white.

a. Young branches bearing rather soft weak spines between the nodes. Leaves densely hairy below and at least sparsely hairy above. Flowers tubular, white or pinkish, hairy. Plants of extreme eastern Washington..*14. G. cognata.*

b. Young branches without spines between the nodes. Leaves finely hairy below, hairless except along the veins above. Flowers tubular, greenish-white, hairless. Plants of extreme eastern Washington.....*15. G. irrigua.*

2. Leaves sometimes hairy but never bearing stalked glands.

a. Leaves with round few-toothed lobes, wedge-shaped to straight across at the base. Young branches reddish-brown, without spines between the nodes. Flowers tubular, white, borne on slender, rather long individual fruit-stalks. Plants occurring only in extreme southeastern Washington.....
.....*16. G. nivea.*

b. Leaves with pointed lobes, finely toothed, heart-shaped to nearly straight across at the base. Young branches gray to brown, smooth, spiny or hairy. Flowers greenish, sometimes tinged with purple, shortly and broadly tubular.

(1) Stems and branches bearing strong, stout spines at the nodes. Plants occurring only west of the summit of the Cascades.....*17. G. divaricata.*

(2) Stems and branches with only small, inconspicuous spines at the nodes, these often wanting on many of the branches. Plants occurring only east of the Cascades.....*18. G. inermis.*

RIBES DISTRIBUTION IN RELATION TO
PHYSIOGRAPHY AND CLIMATE.

In determining a Ribes plant considerable assistance can be derived from an accurate knowledge of the locality and the site conditions in which the plant grows. The various Ribes species demand certain quite definite site conditions, and will only be found in regions where these conditions occur. So far as the information is now available, notes have been added at the end of the description of each species, giving the typical site conditions and the distribution for that species. There are, however, certain broader conceptions which will also aid in making determinations, and some of these are given here.

From the climatological and physiographical standpoint, the state of Washington readily falls into two major divisions, the western or humid region, and the eastern or semi-arid region. As the moisture-laden southwest winds come in from the Pacific Ocean, they are forced upward by the Olympic and Cascade Mountains, and as a result much of their moisture is precipitated. For this reason the general region including the Pacific Coast, the Olympic Mountains, the Puget Sound, and the west slopes of the Cascades is one of heavy rainfall, and generally high humidity. This is characteristically a region of dense, luxuriant coniferous forests, at low altitudes largely composed of Douglas fir (*Pseudotsuga taxifolia*), western red cedar (*Thuja*

plicat), and western hemlock (*Tsuga heterophylla*). At somewhat higher altitudes, western white pine (*Pinus monticola*), lodge-pole pine (*Pinus contorta*), and silver fir (*Abies amabilis*) are found mixed with the former species. At still higher altitudes, near timberline, the forests largely consist of white-bark pine (*Pinus albicaulis*), alpine fir (*Abies lasiocarpa*), and mountain hemlock (*Tsuga mertensiana*).

As the winds from the Pacific Ocean have deposited much of their moisture west of the summit of the Cascades, the region east of this summit is relatively much dryer, and to a large extent is semi-arid. Taken as a whole, the region east of the summit of the Cascades is one of open yellow pine (*Pinus ponderosa*) forests, prairie, and sagebrush.

It will be obvious that no such definite division line as the summit of the Cascades can be laid down on the basis of moisture. The best example of this is the fact that in reality the humid region extends beyond the summit of the Cascades, down the east slope for some distance. Other factors than the moisture-laden winds from the Pacific Ocean enter into the matter, the principal one being altitude. The slow melting of snow at high altitudes tends to equalize the soil moisture throughout the year. Thus we find that the forests of the higher altitudes of the humid region extend for some distance east of the summit of the Cascades. Directly east of and below these forests of the humid type on the east slopes we find the open yellow pine

forests, the true beginning of the semi-arid region. Below the yellow pine forests and occurring in irregular altitudinal belts in the following order are the open prairie, or bunchgrass country, and the sagebrush country. These three types of country, the yellow pine forests, the open prairies, and the sagebrush, continue across the balance of eastern Washington, occurring according to altitude, until in the Blue Mountains of southeastern Washington and the higher mountains of the northeast a sufficient altitude is reached to closely approximate the conditions found on the upper part of the east slopes of the Cascades. But such places are relatively small in extent, and are always considerably drier than the west slopes of the Cascades.

An examination of the distribution of the various *Ribes* species of Washington will reveal the fact that they are readily divisible into two large groups, one of which prefers humid conditions and is found in the humid region, the other preferring drier localities and occurring only in the semi-arid region. These two groups are as follows:

Group 1. *Ribes* of the humid region.

- | | |
|-----------------------|----------------------|
| <i>R. bracteosum</i> | <i>G. lobbii</i> |
| <i>R. acerifolium</i> | <i>G. watsoniana</i> |
| <i>R. sanguineum</i> | <i>G. divaricata</i> |
| <i>R. laxiflorum</i> | |
| <i>R. triste</i> | |
| <i>R. lacustre</i> | |

Group 2. Ribes of the semi-arid region.

- | | |
|------------------|-------------|
| R. petiolare | G. cognata |
| R. aureum | G. irrigua |
| R. cereum | G. nivea |
| R. viscosissimum | G. inermis. |
| R. lacustre | |
| R. montigenum | |

Thus, of the 18 species of Ribes occurring in Washington, 8 grow only in the humid region, 9 only in the semi-arid region, and one occurs in both. R. lacustre, the only species occurring in both regions, is a plant more exacting in its demands for soil moisture than for anything else. It is typically a swamp or moist land species, and is equally at home on lake shores, in swampy places, or close to streams in the yellow pine areas of eastern Washington as in the humid region of western Washington. It will be noted concerning this species that in the semi-arid region it occurs only in the yellow pine areas.

This fact, that the Ribes of Washington are divisible into two groups, one of which occurs only in the humid region and the other only in the semi-arid region, will often be of considerable assistance in determining to what species a Ribes plant belongs. If a plant is found growing in the humid region we can be satisfied only with a determination which puts it in a species of the humid region. This will often preclude the chance of error in deciding between two closely related species, one of the humid and the other

of the semi-arid region. An example of this is the case of *R. bracteosum*, a plant of the humid region, and *R. petiolare*, a plant of the semi-arid region. These two species are closely related and are rather similar in appearance. There can, however, be no doubt in deciding between these species if the locality in which the plant is found is taken into consideration. Similarly, there can be no confusion between *G. divaricata*, a humid region species, and *G. inermis*, a semi-arid region species.

In a similar manner, the matter of altitude will be helpful in determining certain *Ribes* species. A number of species are found only at the higher elevations in the mountains. These are, of course, of the humid region group, whether occurring immediately east or west of the summit of the Cascades, with the exception of *R. montigenum*, which always chooses open, very dry slopes near the tops of mountains. But of the humid region group, *R. acerifolium*, *R. triste*, and *G. watsoniana* are found only at high altitudes.

Of the semi-arid region group, *R. viscosissimum* is to be expected only in the yellow pine forests, which represent the highest altitudinal portion of this region. On the other hand, *R. aureum* and *G. nivea* are found only along streams in the lowest parts of this region, which are typified by the presence of sagebrush.

RUSTS OCCURRING ON RIBES IN THE WEST.

By Ellsworth Bethel, Pathologist,
Office of Forest Pathology.

Ribes are hosts, not only for *Cronartium ribicola*, the white pine blister rust fungus, but for a number of other rusts which are often found in the field, and in a general way somewhat resemble the blister rust. It is necessary that blister rust men be able to distinguish these various rusts on Ribes.

Rusts can be recognized by the powdery appearance of their fruiting stages, which are white, black, orange, yellow, or red in color. This color comes from the spores which are borne in definite groups termed sori. The sori or fruiting bodies arise from the fungus threads within the tissues of the leaf, and often scarcely project beyond the epidermis, but in other cases may appear as long cluster-cups, or as telial horns. The sori may be covered by a whitish membrane known as the peridium, which later ruptures to free the spores. The sori, depending on the type of spores produced, are termed pycnia (0), aecia (I), uredinia (II), and telia (III). If an aecium has no peridium it is called a caecma. If the aecium is cup-shaped and the peridium toothed after rupture the name aecidium is applied, while Peridermium denotes an aecium on pines with the peridium split or irregularly ruptured. A spore stage normally occurring on leaves is said to be foliicolous; on stems, caulicolous.

The following is a key to the rusts on Ribes which may be found in the state of Washington.

I. Aecia and pycnia on Ribes leaves.

A. Aecia borne in definite cluster cups, which are covered until maturity.

1. Aecia rather short, broad, pale red and densely aggregated. Widely distributed in Washington, on many species of Ribes. Associated with sedges (*Carex*)
.....
..... *1. Puccinia Grossulariae.*

2. Aecia long, slender and a bright orange-red. Not previously reported from Washington, but may be found in association with rice-grass (*Oryzopsis*)
.....
..... *2. Puccinia micrantha.*

B. Aecia not in definite cluster cups, but borne as naked pustules. Widely distributed over Washington, always associated with willows (*Salix*).....
..... *3. Melampsora confluens.*

II. Uredinia and telia on Ribes leaves.

A. Telia large, black. Occurs in Washington in damp situations. Thus far found only on *R. lacustre*,.....
..... *4. Puccinia Parkeriae.*

B. Uredinia yellowish or reddish, in flat or slightly elevated pustules.

1. Uredinia large and flat, the size of a pinhead, developing singly or in concentric circles, yellowish-red, without a peridium. The uredinia-sori become red and waxy in the telial stage.

Not known to occur in Washington, but may be found on wild or cultivated yellow flowering currants.....

..... *5. Coleosporium ribicola.*

2. Uredinia much smaller than in *Coleosporium ribicola*, appearing in irregular groups of small yellowish pustules.

Peridium persistent, liberating yellowish spores through a small apical opening. Telia later appearing among the uredinia as hairlike horns, giving a fuzzy aspect to the under side of the leaf..... *6. Cronartium ribicola.*

LIFE CYCLES OF THE RUSTS ON RIBES.

1. *Puccinia Grossulariae.*

O and I on leaves of Ribes.

II and III on leaves of sedge (*Carex*).

2. *Puccinia micrantha.*

O and I on leaves of Ribes.

II and III on leaves of rice-grass (*Oryzopsis*).

3. *Melampsora confluens.*

I on leaves of Ribes.

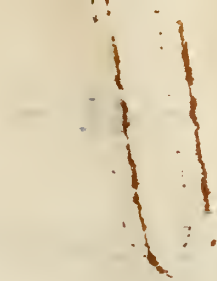
II and III on leaves of willow (*Salix*).

4. *Puccinia Parkeræ.*

III on leaves of Ribes. This rust has the telial stage only.

5. *Coleosporium ribicola.*

O and I on needles of pinyon (nut) pines.



1877

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